

A KEY TO SOME AUSTRALIAN GENERA OF LARGE NOCTURNAL ICHNEUMONIDAE (HYMENOPTERA), INCLUDING FLIGHT PERIODICITIES AND INFLUENCE OF MOON PHASE ON LIGHT TRAP CATCHES

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Abstract

A simple key to some of the genera of large, nocturnal ichneumonid wasps found in southeastern Australia is provided, along with information about their flight periodicities and the influence of moon phase on light trap catches. Approximately 74% of wasps caught were active between 2130 and 0245 h and more were caught on new moon nights than on full moon nights.

Introduction

Large (*i.e.* forewing ≥ 15 mm long), nocturnal ichneumonid wasps are commonly caught when UV light trapping in southeastern Australia and undoubtedly form an important guild of natural enemies of other insects. Similarities in morphology and colouration between different genera may deter non-taxonomists from identifying them, thus limiting the recording of their diversity and abundance.

Nocturnal wasps generally have swollen ocelli, very long antennae and are entirely or almost entirely orange-brown in colour (Fig. 1). This appearance is called the 'ophionoid facies' and occurs mainly in the Ichneumonoidea (Braconidae and Ichneumonidae) and some tropical Chalcidoidea and Vespoidea (Huddleston and Gauld 1988). Many nocturnal parasitic wasps attack the nocturnally active larvae of Lepidoptera (*e.g.* Noctuidae) and Symphyta, some of which are of significant economic importance (Huddleston and Gauld 1988; hosts listed in Table 1). Although similarities in circadian rhythms and their parasitoid lifecycle might logically place them in a single functional group (*i.e.* 'natural enemies'), such a grouping would provide only limited insight into the specific impacts of the different taxa on other biota in a given ecosystem.

Large nocturnal wasps are distinctive and easily extracted from a typical light trap catch. In our studies, Ichneumonidae accounted for all but one of many hundreds of specimens examined from light traps in southeastern Australia,

Table 1. Host records for large nocturnal ichneumonids of Australia (compiled from Gauld 1984). Host families lepidopteran except Pergidae (Hymenoptera).

Ichneumonid taxon	Host family	Host species
<i>Cidaphus</i>	No records	Non-Australian species are secondary parasitoids of moths and sawflies via Ichneumonidae
<i>Hypopheltes</i>	Pergidae	<i>Perga</i> sp., <i>Pseudoperga belinda</i> Kirby
<i>Megaceria</i>	Geometridae	<i>Mnesampela privata</i> (Guenée), <i>Paralaea</i> Guest (as <i>Stathmorrhopa</i> sp.)
<i>Netelia</i>	Notodontidae	Unidentified pupa
	Noctuidae	<i>Agrotis infusa</i> (Boisduval), <i>Agrotis munda</i> Walker, <i>Helicoverpa armigera</i> (Hübner), <i>Helicoverpa</i> sp., <i>Mythimna convector</i> (Walker), <i>Mythimna separata</i> (Walker), <i>Persectania ewingii</i> (Westwood), <i>Spodoptera exempta</i> (Walker), <i>Spodoptera litura</i> (Fabricius)
Ophioninae	Pieridae	<i>Pieris rapae</i> (Linnaeus)
	Anthelidae	<i>Anthela varia</i> (Walker), <i>Anthela</i> sp.
	Geometridae	<i>Chlenias</i> sp.
	Lymantriidae	<i>Acyphas</i> sp.
	Noctuidae	<i>Mythimna separata</i> (Walker), <i>Mythimna</i> sp., <i>Persectania</i> sp.



Fig. 1. *Netelia* sp., female. Habitus illustrating an ichneumonid with ophionoid facies (length 18 mm from face to tip of abdomen, excluding ovipositor).

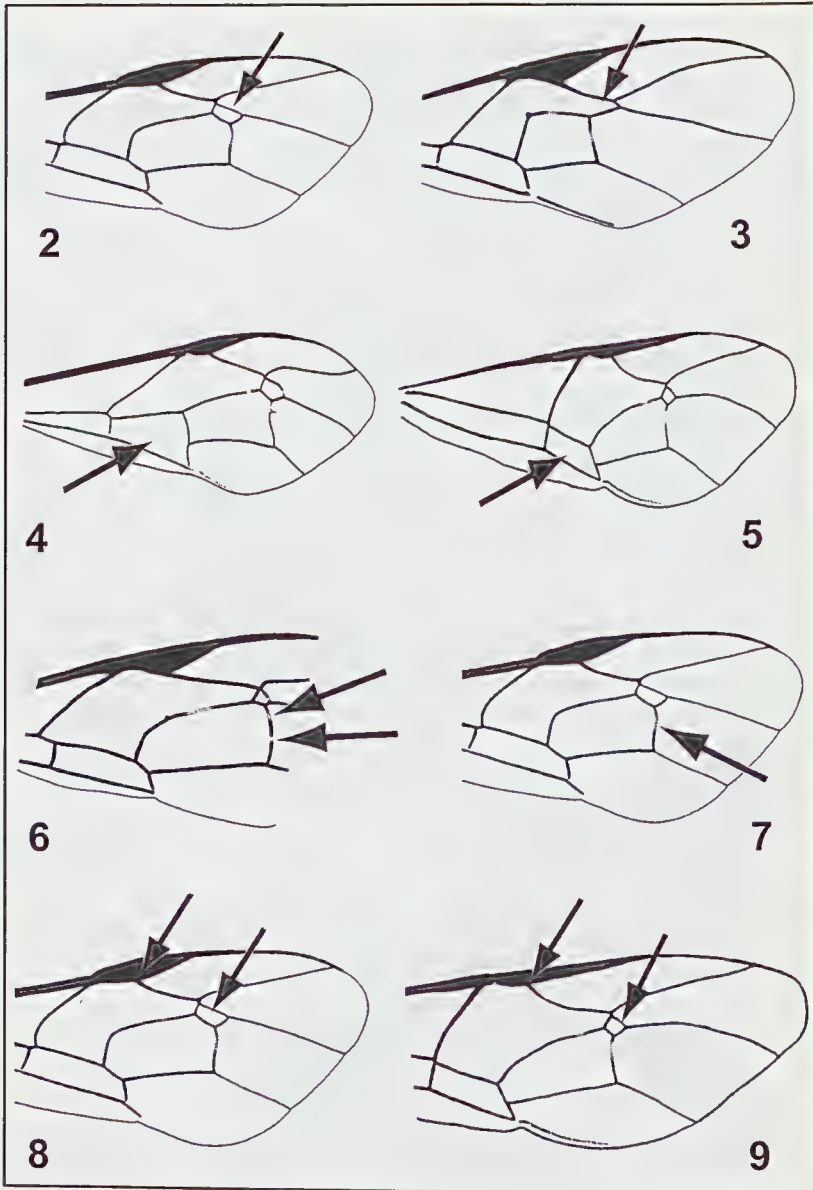
the exception belonging to the family Aulacidae. We collated information about this group while conducting routine light-trapping as part of another study. Accordingly, we compiled a key to the large, nocturnal ichneumonid genera (excluding the Ophioninae – see below). The key is aimed at non-taxonomists and is much less formidable than the keys to Australia's Ichneumonidae provided by Gauld (1984).

We used Gauld (1984) as a guide to the Australian genera of nocturnal Ichneumonidae, supplemented by material in the Australian National Insect Collection, CSIRO Entomology, Canberra, and our own material. The key was constructed by compiling information from Gauld (1984) and with reference to Gauld and Huddleston (1976) and Huddleston and Gauld (1988).

Key to some Australian genera of large nocturnal Ichneumonidae

This key is designed for non-taxonomists and uses only easy-to-see characters of the forewing. However, the eight Australian genera of Ophioninae cannot be separated so easily and have not been included; keys to these genera can be found in Gauld (1977, 1984). Our key is applicable to any ichneumonid with ophionoid facies and a forewing at least 12 mm in length. A key covering smaller ichneumonids would need to include *Anacis* Porter, *Mesochorus* Gravenhorst and perhaps other genera. Light traps also occasionally catch wasps that do not exhibit ophionoid facies. These wasps are probably not nocturnal but might be crepuscular or have been disturbed by the setting up or operation of the trap (Gauld and Huddleston 1976).

- 1 Forewing with two intercubital veins that enclose a small cell, the areolet (Fig. 2); in *Netelia* lower part of distal intercubital vein often missing 2
 - Forewing with a single intercubital vein and no areolet (Fig. 3) Ophioninae (not keyed further)
- 2 First subdiscal cell of forewing much higher at distal end than at proximal end (Fig. 4) *Megaceria* Szépligeti
 - First subdiscal cell of forewing about same height at each end (Fig. 5) ... 3
- 3 Forewing vein 2m-cu with two widely separated bullae (unpigmented portions of the vein crossed by flexion lines) (Fig. 6) *Netelia* Gray
 - Forewing vein 2m-cu with a single long bulla (Fig. 7) 4
- 4 Areolet approximately rectangular, about twice as long as wide (Fig. 8, lower arrow); pterostigma (thickened vein about halfway along anterior margin of forewing) moderately broad, r-rs vein arising near its centre (Fig. 8, upper arrow) *Cidaphus* Förster
 - Areolet diamond-shaped (Fig. 9, lower arrow); pterostigma long and narrow, r-rs vein arising near its proximal end (Fig. 9, upper arrow) *Hypopheltes* Cushman



Figs 2-9. Venation of the distal portions of the forewings of large nocturnal ichneumonids, encompassing the genera *Megaceria* (Fig. 4), *Netelia* (Fig. 6), *Cidaphus* (Fig. 8) and *Hypopheltes* (Fig. 9). Venation typical of species belonging to the Ophioninae is shown in Fig. 3. Arrows indicate locations of features mentioned in the key. Compiled from Gauld (1984).

Summary of light trap catches

The study site was an experimental planting of 500 eucalypts located near Hall, ACT (35°09'55.7"S, 149°02'49.9"E; altitude 615 m a.s.l.). The two light traps used were custom made so that they could sub-sample in seven periods from 1800 to 0600 h (illustrated in Steinbauer 2003).

We did not develop the above key until after our trapping was complete. Consequently, the following findings relate to large nocturnal ichneumonids as a whole rather than individual genera or species. Our light trapping yielded a total of 625 large nocturnal wasps. Based on a small sub-sample, we estimate that approximately 75% of the wasps were species of *Netelia* and the remainder Ophioninae.

The number of wasps caught fluctuated considerably from night to night but there was a clear downward trend in numbers from December to May (Fig. 10; see also Steinbauer *et al.* 2001, p. 530). The numbers of wasps caught showed a clear peak between 2130 and 0245 h, with 73.6% of them being caught in this period (Fig. 11). The phase of the moon also appears to have influenced the number of wasps collected, with more caught near the new moon than near the full moon (Fig. 12).

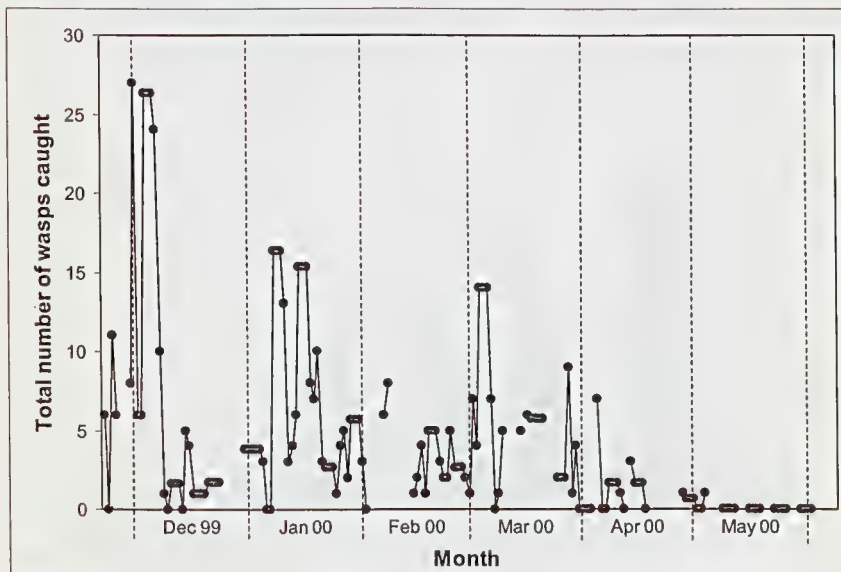


Fig. 10. Total number of large nocturnal wasps caught in light traps versus day of year ($n = 625$ individuals).

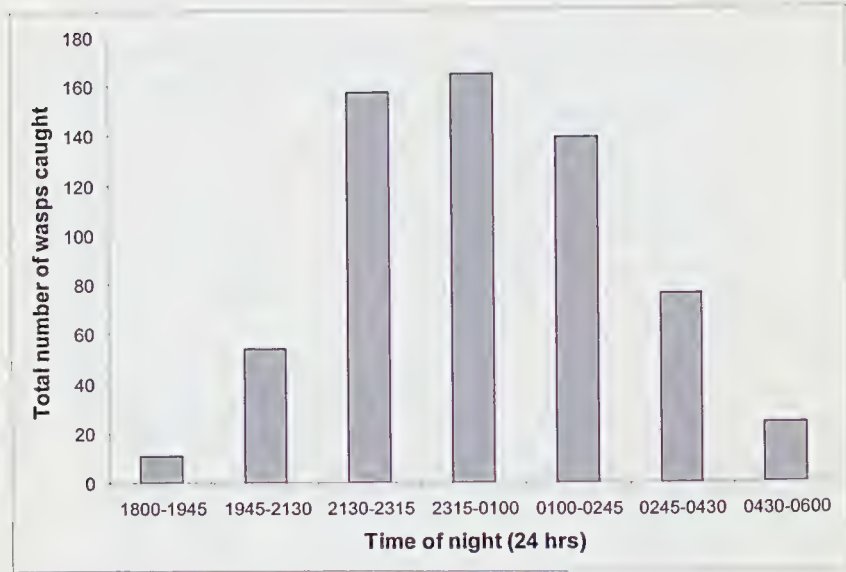


Fig. 11. Total number of large nocturnal wasps caught in light traps versus time of night ($n = 625$ individuals).

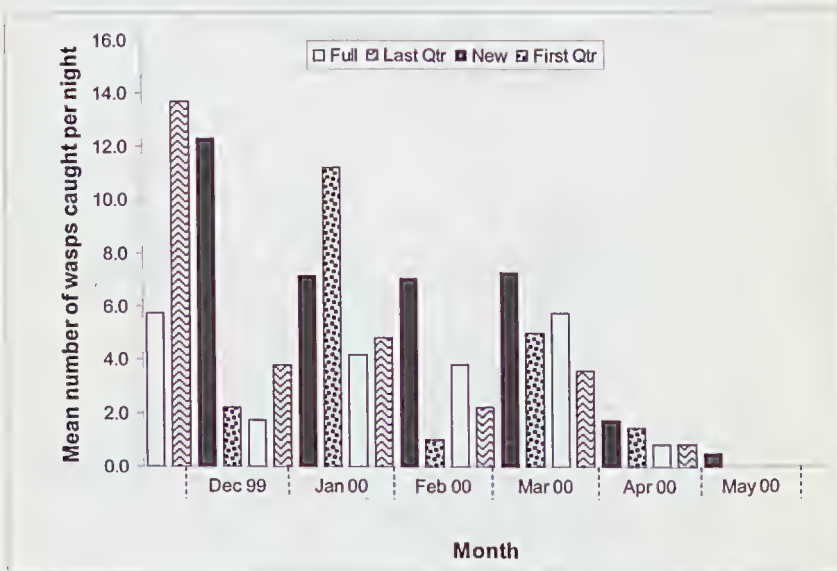


Fig. 12. Average number of large nocturnal wasps caught in light traps versus phase of moon (average computed for phase ± 2 nights).

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